

**UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION**

REPORT OF INVESTIGATION

Surface Nonmetal Mine
(Sand & Gravel)

Fatal Powered Haulage Accident
July 15, 2006

Terrassa Sand & Gravel #1
Terrassa Sand & Gravel, Inc.
Barrio Pinas, Puerto Rico
Mine I.D. No. 54-00081

Investigators

Jose J. Figueroa
Mine Safety and Health Inspector

James L. Angel
Mechanical Engineer

Originating Office
Mine Safety and Health Administration
Southeast District
135 Gemini Circle, Suite 212, Birmingham, AL 35209
Michael A. Davis, District Manager



OVERVIEW

Miguel Vazquez, truck driver, age 61, was fatally injured on July 15, 2006, when the haul truck he was operating in the mine extraction area backed into a water filled pit.

The accident occurred because safe operating procedures were not established to ensure that the extraction area was safe to resume operations after being flooded and idle. An examination of the extraction area was not completed on the previous day or the day of the accident. There were no barricades or warning signs installed in mine extraction area to identify the location of the water filled pit and warn miners of the hazard. The ground in the area was covered with muddy water and the location of the pit was not visible. Management did not conduct a risk assessment to identify all possible hazards and establish safe work procedures for the extraction area after the flood and before work commenced.

GENERAL INFORMATION

Terrassa Sand & Gravel #1, an open pit, sand and gravel operation, owned and operated by Terrassa Sand & Gravel, Inc., was located on Road PR-827 Km. 8, Barrio Pinas, about 3 miles west of Toa Alta, Puerto Rico. The principal operating official was Maximo Marcato, aggregates operations manager. The mine operated one eight-hour shift per day, five days a week. Total employment was 15 persons.

A dragline was used to dig sand and gravel from the river banks and the pit of the extraction area. The material was hauled by trucks to the processing plant where it was screened, sized, washed, and stockpiled. Finished products were sold for use in the construction industry.

The last regular inspection at the operation was completed on December 29, 2005.

DESCRIPTION OF ACCIDENT

The accident occurred at the extraction area located along the banks of the La Plata River. Five days prior to the accident, management was notified that the locks of a dam located upstream of the mine were going to be opened due to recent heavy rains. The extraction area of the mine flooded and production ceased.

The day before the accident, the flood waters receded so management discussed the possibility of returning to the extraction area. Heriberto Reyes, mechanic, was left in charge to direct the miners. About 7:00 am, Maximo Marcato, aggregates operations manager, told Reyes, by telephone to return to work in the extraction area. At 7:15 am, Reyes met with Manuel Diaz, truck driver; Efrain Villanueva, excavator operator; Cesar Perez, dragline operator; and Miguel Vazquez, truck driver (victim).

Reyes instructed Perez to move the dragline to the pit and start loading trucks. He told Reyes that the area was not safe because the edge of the pit was obscured by the standing water in the extraction area and could not be seen. Perez suggested that gravel be placed on the area adjacent to the water filled pit as an indicator of the location of the pit but Reyes declined. Villanueva suggested that he could load trucks with the excavator at the south corner of the pit since it wasn't covered with water. Reyes agreed and Villanueva moved the excavator to the south corner of the extraction area and started loading material into the haul trucks. Manuel Diaz and Vazquez worked all day, each hauling about 12 loads of material from the extraction area to the plant.

On the day of the accident, Vazquez reported to work at 7:00 a.m., his normal starting time. Vazquez met with other employees at the outside break room and then went to check his assigned haul truck. About 7:30 am, he took Villanueva to the excavator parked at the entrance of the extraction area.

Vazquez left Villanueva, drove his haul truck into the extraction area, and parked it near the water filled pit that was the normal loading area prior to the flooding. After Villanueva inspected the excavator, he moved it to the south corner of the extraction area where he had worked the previous day.

At approximately 7:45 am, Villanueva dug a bucket of material and positioned it in front of the excavator, a typical procedure to provide the truck drivers with a reference point to backup into the excavator loading area. Villanueva saw Vazquez start backing his truck into the standing water. Apparently Vazquez was using the truck's rear view mirrors to find the excavator and inadvertently backed into the water filled pit.

Manuel Diaz saw the accident and traveled in his haul truck from the accident site to the maintenance shop located approximately ½ mile away. He told Reyes that the other truck fell inside the pond and that Vazquez was missing. Reyes immediately called Marcano on his mobile phone to report the accident. Marcano arrived shortly and called the police. Emergency medical personnel and Puerto Rico police divers arrived at 8:45 a.m. and recovered Vazquez about three hours later. The District Attorney pronounced the victim dead at 11:45 a.m. Death was attributed to drowning.

INVESTIGATION OF THE ACCIDENT

MSHA was notified of the accident at 9:15 a.m. (ET) on July 15, 2006, by a telephone call from Sandra Cartagena, human resources administrator, to Juan A. Perez, supervisory mine safety and health inspector. An investigation was started the same day. An order was issued under the provisions of Section 103(k) of the Mine Act to ensure the safety of the miners. MSHA'S accident investigation team traveled to the mine, made a physical inspection of the accident scene, conducted interviews, and reviewed conditions and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management and employees.

DISCUSSION

Accident Location

The accident occurred at the mine extraction area located near the La Plata River. The area around the accident site was fairly level but muddy. The pit and its adjacent area were submerged. The water was about five feet from the pit's edge at the location where the truck entered the pit. The pit had a near vertical drop off and was approximately 20 feet deep. The edge of the pit could not be seen through the muddy water.

Prior to backing into the water filled pit, tire tracks indicated the haul truck traveled in a straight direction, heading approximately west-northwest. This would have placed the sun behind the driver and over his right shoulder. The tire tracks also indicated that as the haul truck was backing up, it was articulated to approximately the full left position. This would have changed the position of the left side rear view mirror from facing approximately east-southeast to facing more east-northeast, the location of the sun at the time of the accident. Considering the movement of the left side mirror more in the direction of the sun and the convex surface of the mirror, which provides a wider view, it is possible that the victim may have been temporary blinded or distracted by the sun's reflection in the mirror.

Examinations

Israel Diaz, mine supervisor, was on vacation from July 7, 2006, through the time of the accident and he had assigned Heriberto Reyes to be in charge of the operation. Maximo Marciano was not at the mine site at the time of the accident. No one was assigned to conduct the examinations. Israel Diaz last examined the mine extraction area for hazards on July 6, 2006.

Weather

At the time of the accident, the weather was clear with a temperature of 80 degrees Fahrenheit.

Haul Truck

The haul truck involved in the accident was a Caterpillar D400D Articulated Hauler, manufactured in 1990. It was approximately 35 feet long, 11 feet wide, and 12 feet high and had a rated load capacity of 40 tons. The truck had a tractor and a trailer unit. The truck was powered by a Caterpillar Model 3406B, six cylinder, turbocharged, diesel engine. The transmission had a forward-neutral-reverse selector and a four speed gear selector, providing four forward speeds and four reverse speeds. The transmission had an integral hydraulic retarder. The articulated-frame truck steering was actuated by hydraulic cylinders. The truck had six-wheel drive, with one axle on the tractor unit and two axles on the trailer.

The truck was submerged in the water filled pit for six days before being recovered. Other than water damage from the accident, no physical damage was observed on the truck.

Brake System

The truck was equipped with service, parking, and secondary brake systems. The service brake system consisted of brake chambers at all six wheels that activated drum and shoe wedge type brakes. The tractor brakes were hydraulically applied by an air/hydraulic actuator. The trailer

brakes were applied by air pressure. The service brakes were controlled by a foot pedal in the operator's compartment. Independent air supplies were provided to the tractor and trailer brake circuits.

The parking brake was activated by a park/secondary control handle in the operator's compartment. When this handle was placed in the park position, the spring applied-pressure released parking brake system applied the same drum and shoe wedge brakes on the four trailer wheels as used by the service brake system. The parking brakes were released by supplying air pressure to compress the spring.

The secondary brake system was activated by the park/secondary control handle in the operator's compartment. When this handle was placed in the secondary position, air pressure was supplied to activate the air/hydraulic actuator and apply the tractor brakes. At the same time, it causes air to vent from the parking brake chambers which allows the parking brake springs to apply the brakes on the trailer axles.

The truck was not equipped with an optional engine brake.

The haul truck engine was put into running condition following the accident to allow operational brake testing. Testing of the tractor brakes after its brake system was bled did not reveal any hydraulic leaks or other problems.

Both the parking and service brake met the Caterpillar brake holding ability specifications.

Steering System

The articulated-machine frame steering was provided by double-acting hydraulic steering cylinders that provided 45 degree left and right steering. Caterpillar specified an SAE turning radius of 25'9". The tire tracks at the accident site indicate a turning radius (to the left) of approximately 26'9". The machine was steered nearly to its left steering stop prior to the accident.

The hydraulic filters for the steering system (and other hydraulic functions) were removed and inspected. No significant accumulation of debris was observed on the filters.

A steering time test was performed. No damaged, leakage, or operational problems were noted with the steering system.

Seat Belt

A functional seat belt was provided for the operator's seat. The belt buckled and unbuckled without difficulty.

Controls

The positions of the operator's controls were observed after the recovery of the truck. The engine start switch (key) was in the on (run) position. The transmission forward/reverse selector lever was in the forward position. The 1 through 4 gear speed selector was in first gear. The retarder lever was in the full up (disengaged) position. The parking brake was in the full forward, disengaged (off) position.

Tires

The truck was equipped with 29.5-25 bias ply tires from various manufacturers. The tires were in good to fair condition.

Mirrors

The truck was equipped with two rectangular, convex rear view mirrors, one on the left side and one on the right side. The mirrors were intact and not loose. There was no indication that the position of the mirrors had changed during or since the accident.

TRAINING AND EXPERIENCE

Miguel Vazquez had 33 years of mining experience and 33 years experience driving haul trucks, all with Terrassa Aggregates, Inc. He had received training in accordance with 30 CFR, Part 46. .

ROOT CAUSE ANALYSIS

A root cause analysis was conducted and the following root causes were identified:

Causal Factor: A risk assessment to determine possible hazards and to establish work procedures was not conducted prior to resuming work in the mine extraction area.

Corrective Action: Management should implement procedures that require risk assessment be conducted to identify and correct potential hazards associated with the task to be performed. Employees should be trained and knowledgeable of the procedures involved in conducting a risk assessment.

Causal Factor: Management policies, standards, and controls were inadequate. Examinations had not been conducted to evaluate the hazards at the mine extraction area the day prior to the accident or on the day of the accident. The mine supervisor was on vacation and no one was assigned to conduct the examinations.

Corrective Action: Procedures should be established to ensure that workplaces examinations are conducted in all areas. Procedures should be implemented to ensure that competent persons are designated and trained in hazards recognition.

CONCLUSION

The accident occurred because safe operating procedures were not established to ensure that the extraction area was safe to resume operations after being flooded and idle. An examination of the extraction area was not completed on the previous day or the day of the accident. There were no barricades or warning signs installed in mine extraction area to identify the location of the water filled pit and warn miners of the hazard. The ground in the area was covered with muddy water and the location of the pit was not visible. Management did not conduct a risk assessment to identify all possible hazards and establish safe work procedures for the extraction area after the flood and before work commenced.

ENFORCEMENT ACTIONS

Terrassa Sand & Gravel, Inc

Order No. 6072531 was issued on July 15, 2006, under the provisions of Section 103(k) of the Mine Act:

A fatal accident occurred at this operation on July 15, 2006, when a haul truck backed into a water filled pit in the extraction area. This order is issued to assure the safety of all persons at this operation. It prohibits all activity at the extraction area, until MSHA has determined that it is safe to resume mining operations in the area. The mine operator shall obtain prior approval from an authorized representative for all actions to recover and/or restore operations to the affected area.

The order was terminated on July 31, 2006. Conditions that contributed to the accident no longer exist and normal mining operations can resume.

Citation No. 6072537 was issued on September 18, 2006, under the provisions of Section 104(a) of the Mine Act for violation of 30 CFR 56.20011:

A fatal accident occurred at this mine on July 15, 2006, when a truck driver backed his truck into a steep pit at the extraction area. The depth of the pit was obscured by standing water. The steep drop off in the water level was not immediately obvious and no barricades or warning signs were installed in this area to identify the location of the pit and warn employees of the hazard.

The citation was terminated on September 26, 2006 when all the employees were trained in the requirements of the standard.

Citation No. 6072538 was issued on September 18, 2006, under the provisions of Section 104(d) of the Mine Act for violation of 30 CFR 56.18002a:

A fatal accident occurred at this mine on July 15, 2006, when a truck driver backed his truck into a steep pit at the extraction area. The ground in this area was covered with water and the location of the pit was not visible. An examination of this work area for conditions which may adversely affect safety or health had not been completed the day prior to the accident or on the day of the accident. Failure to require examinations of this work area that had been flooded for several days and failure to initiate actions to correct unsafe conditions or to protect workers from hazards constitutes more than ordinary negligence and is an unwarrantable failure to comply with a mandatory safety standard.

The citation was terminated on September 26, 2006 when all the employees were trained in the requirements of the standard.

Approved by: _____
Michael A. Davis
Southeast District Manager

Date: _____

APPENDIX A

Persons Participating in the Investigation

Terrassa Sand & Gravel, Inc.

Maximo Marcano	aggregates operations manager
Israel Diaz	mine supervisor
Heriberto Reyes	mechanic/supervisor
Manuel Diaz	haul truck driver
Efrain Villanueva	excavator operator
Cesar Perez	dragline operator

Puerto Rico Authorities

Luis Pacheco	police diver
Victor Rivera	police diver supervisor
Diana Aviles	district attorney

Mine Safety and Health Administration

Juan A. Perez	supervisory mine safety and health inspector
Jose J. Figueroa	mine safety and health inspector
James L. Angel	mechanical engineer